Processing and Storage Hardware

Lecture 5

Processing Hardware

- The procedure that transforms raw data into useful information is called processing.
- The function of processing hardware is to retrieve and execute instructions (software) provided to the computer.
- Processing may consist of performing calculations and other logical activities.
- The processor (CPU) and memory (RAM) perform this transformation.

The CPU

- The central processing unit (CPU) is the brain of the computer. The CPU follows the instructions of the software to manipulate data into information.
  - The CPU consists of two parts—
    - The Control Unit (CU)
    - The Arithmetic & Logic Unit (ALU)
- The two components are connected by electronic roadway called Bus.

The CPU (cont…)

- Control Unit (CU) : The control Unit tells the rest of the computer system how to carry out program instructions.
- It directs the movement of electronic signals between main memory and the ALU.
- It also directs the movement of electronic signals between main memory and the input and output devices.

The CPU (cont…)

- Arithmetic & Logic Unit : ALU performs arithmetic operations (addition, subtraction, multiplication, division, etc.) and logic operations (equal to, greater then, less then, etc.)

- ALU also controls the speed of those operation.

The CPU (cont…)

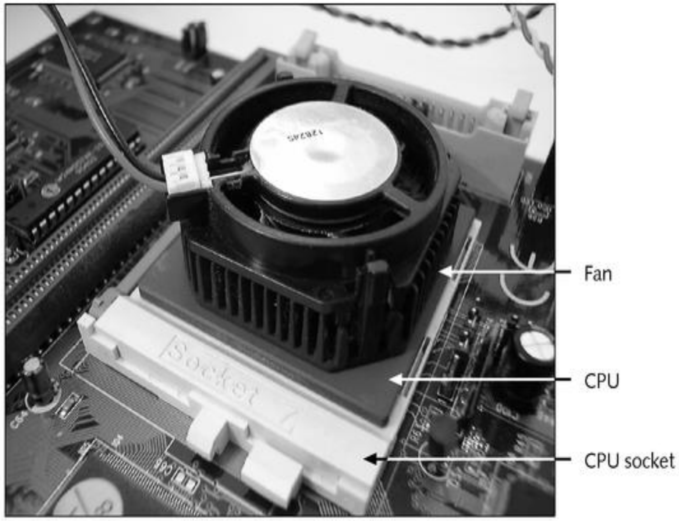


Figure 1-9 Processing of data and instructions is done by the CPU. This Pentium with fan on top is made by Intel.

Primary Memory

- There are four types of primary memory—

1. RAM (volatile)
2. ROM (non volatile)
3. Cache (volatile)
4. Registers (volatile)

Main Memory (RAM)

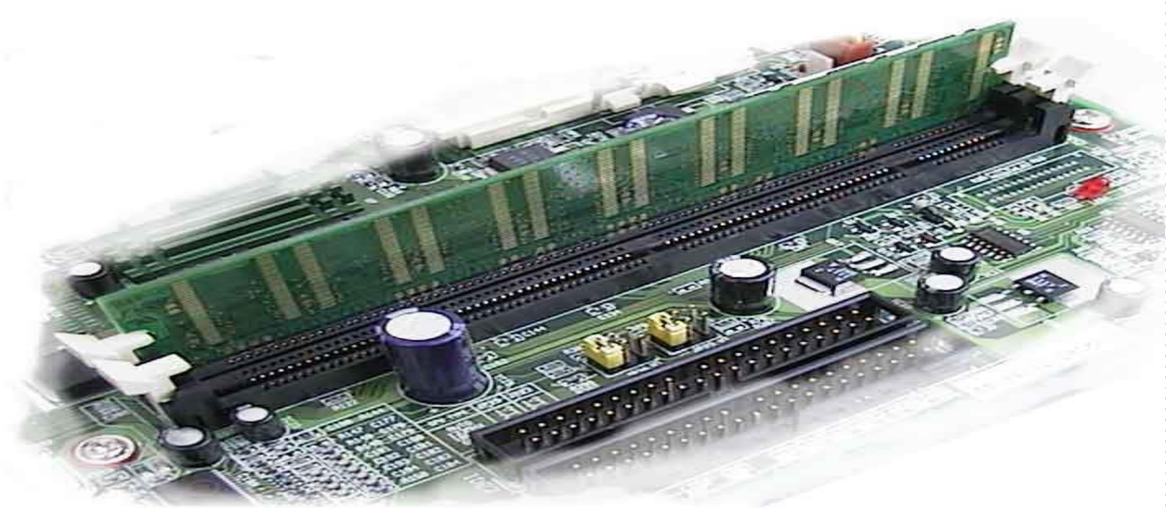
- Main Memory is also called Random Access Memory (RAM), internal memory, primary storage or just memory.

- It has three tasks—

1. It holds data for processing.
2. It holds instructions for processing the data.
3. It holds data that has been processed (information) and is waiting to be sent to an output or storage device.

RAM (cont…)

- RAM is volatile, that means all contents are lost when the electrical power is switched off.



Primary Memory (cont…)

- **ROM (Read only Memory) :** Memory in which some basic instructions are permanently stored.
- ROM is generally used to store programs, routines, and language interpreters for immediate access by the user of the system. Such a program, usually supplied by the manufacturer, is referred to as firmware.
- Many micro computers are supplied with ROM chips that contain the BIOS (Basic Input/Output System).

Primary Memory (cont…)

- Registers : Internal memory of CPU.
  - Number of bits processor can handle.
  - Larger indicates more powerful computer.
  - Increase by purchasing new CPU.

Primary Memory (cont…)

- Cache : Memory that are designed to increase the efficiency of the CPU.

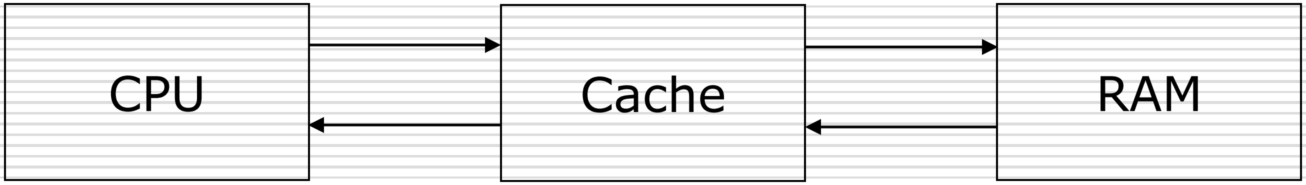


Figure: Cache and main memory

Storage Hardware (Secondary Storage)

- Storage hardware stores data and information in a relatively permanent / non volatile form. That is, the data is not lost when the power is turned off and easy to retrieve when needed for processing.
- There are two types of secondary storage—
    1. Sequential Storage
    2. Direct Access Storage

Secondary Storage (cont…)

1. Sequential Storage : In Sequential Storage data can be accessed and retrieved only in the order in which it was stored in the system. It is suitable for batch processing. Example – Magnetic Tape.

2. Direct Access Storage : In Direct Access Storage data can be accessed and retrieved in any order. It is essential for online system, where information must be processed as it arrives. Example – Magnetic Disk.

Magnetic Tape

- A popular secondary storage device primarily used for storing historical data or for keeping backups of important files.

- It is a sequential storage device. It is low cost, portable and fairly reliable storage device that holds large volumes of data and information.

Magnetic Disk

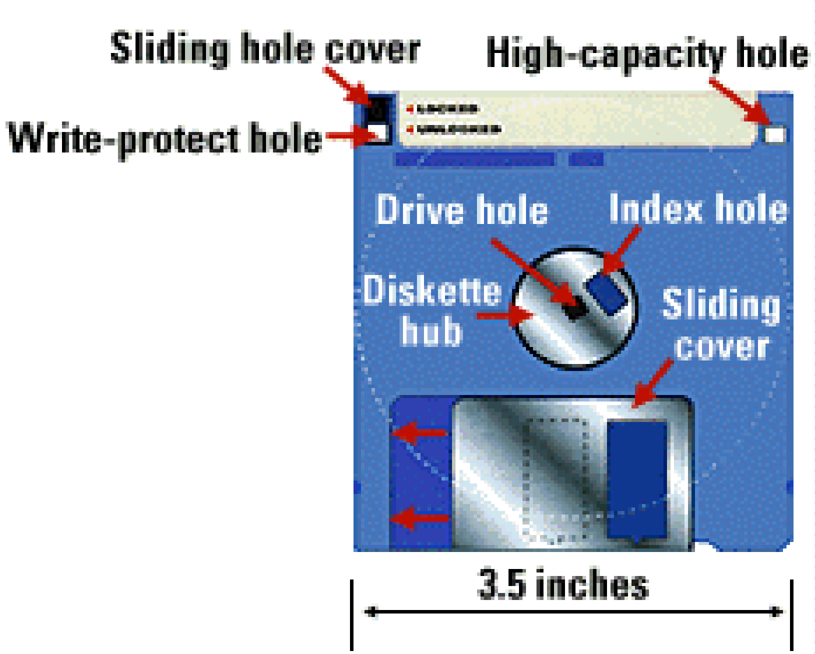
- Magnetic Disk is a popular storage medium for both large and small computers.
- Magnetic Disk is a direct access storage device. It provides direct access to data.
- Magnetic disks come in two form –

1. Floppy Disk
2. Hard Disk

Floppy Disk

Size : 3.5 inch

Capacity : 1.44 MB



Hard Disk / Hard Drive

- Hard disks are made up of several “ hard ” disks (11 disks) or rigid metal platters, a read/ write head mechanism and an electronic drive interface.

- Hard disk access data more quickly and efficiently then floppy disks and are highly reliable. Large computer systems may use multiple hard disks to store data.

Hard Drives (Cont…)

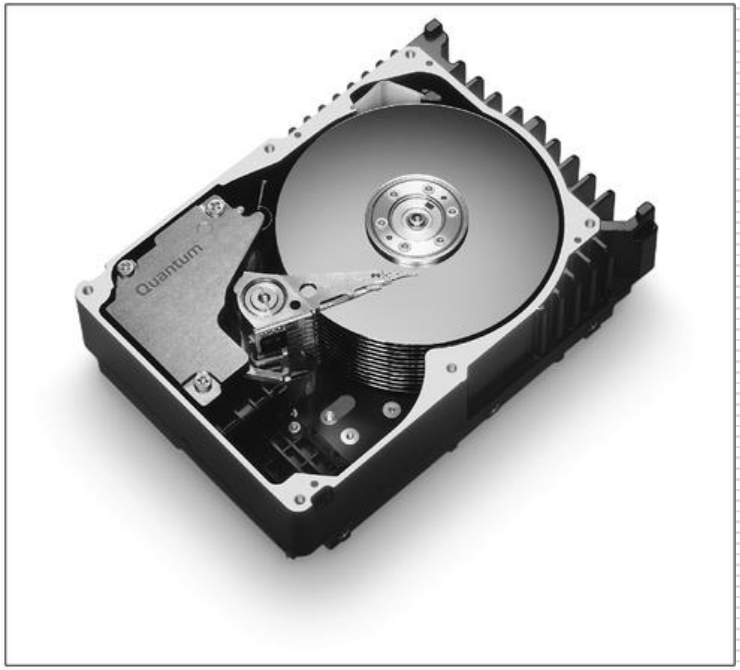
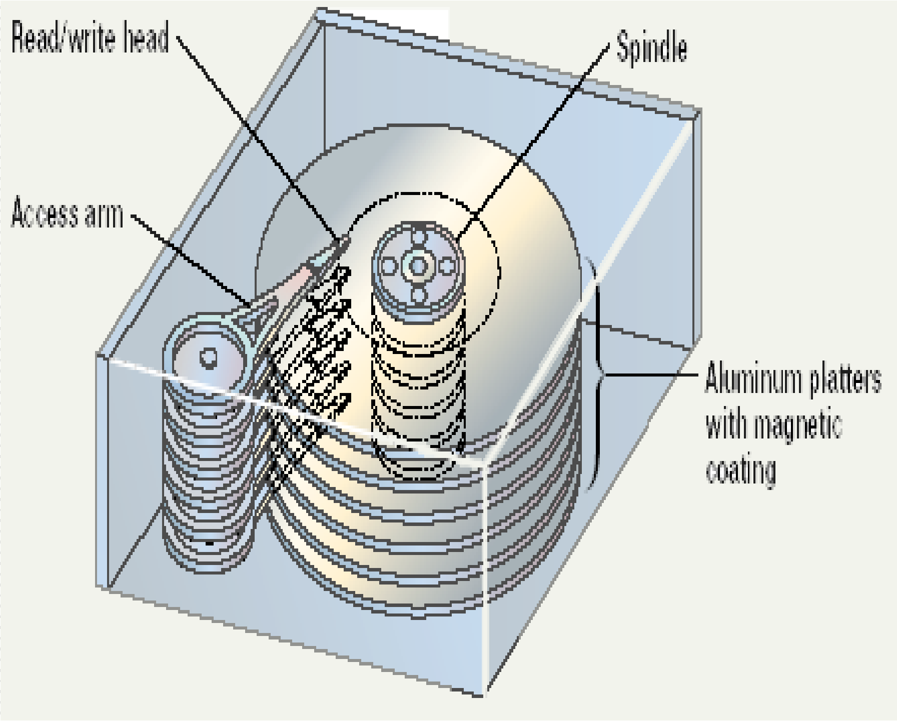


Figure 1-12 Hard drive with sealed cover removed



Compact Disk (CD)

- Compact Disk Read Only Memory, a special kind of disk that has excellent storage capabilities and store different kinds of data such as text, picture, audio and video.

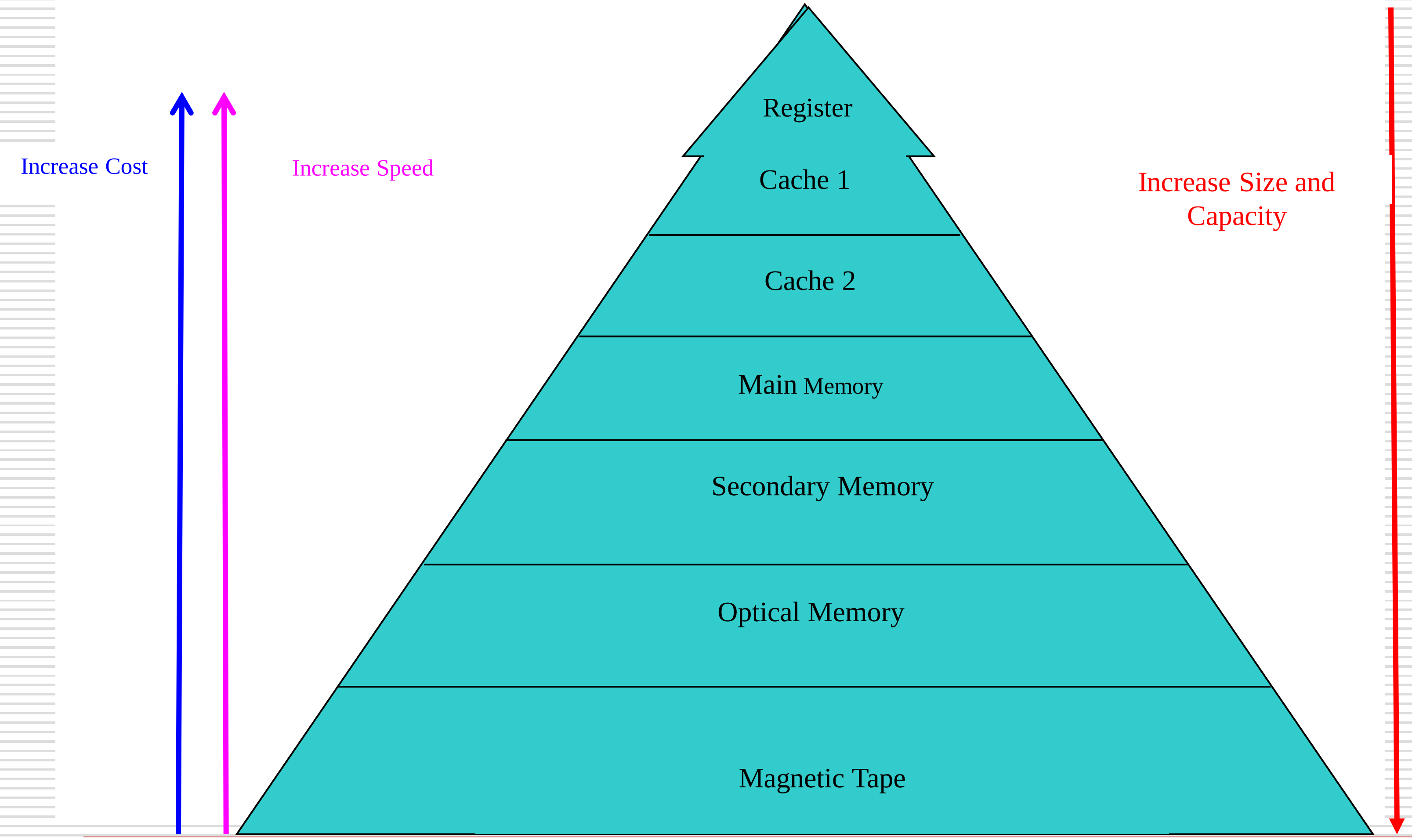
Storage: Bits and Bytes

- Analog information varies continuously.
- Digital information varies discretely.
- Computers store information digitally.
- The smallest unit of information is a bit, or binary digit (1=on, 0=off).
- Each character (letter, number, symbol) is represented with 8 bits = 1 byte.
- 8 bits can represent 2^8=256 characters.

Memory System of Computers

- Primary Memory (RAM, ROM)
- Secondary Memory (H.D.D, F.D)
- Optical memory (CD, DVD)
- Magnetic tape
- Flash Memory
- Register Memory
- Cache memory
- Virtual memory

Memory Hierarchy



Any Question

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Thanks to All